



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/690,912	10/22/2003	Akira Izumi	P/1250-264	6373
2352 7590 01/05/2007 OSTROLENK FABER GERB & SOFFEN 1180 AVENUE OF THE AMERICAS NEW YORK, NY 100368403			EXAMINER CHEN, KIN CHAN	
			ART UNIT	PAPER NUMBER
			1765	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/05/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/690,912

Applicant(s)

IZUMI ET AL.

Examiner

Kin-Chan Chen

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 November 2006.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 7,8,10-12,14,21-24 and 27-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7,8,10-12,14,21-24 and 27-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. Claim 28 recites the limitation "**droplets** of said alkaline solution are injected" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 7, 8, 10, 21, 22, 27, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoki et al. (US 5,635,053; hereinafter "Aoki") in view of Okuda et al. (US 2002/0035762; hereinafter "Okuda") as evidenced by Verhaverbeke (US 5,972,123), Tomita et al. (US 6,431,185; hereinafter "Tomita") and Skee (US 6,465,403).

In a method for cleaning the substrate, Aoki (col.1 lines 36 to 47) teaches a first step of applying alkaline solution (e.g., a mixed solution containing an ammonia water and hydrogen peroxide water), and a second step of applying an acid solution (e.g.,

Art Unit: 1765

mixed solution containing hydrochloric acid and hydrofluoric acid) to efficiently clean the surface of a substrate. Aoki also teaches using the cleaning solutions (alkaline solutions and acid solutions) in multiple steps **in any combinations** (col. 1, line 42, see also the example starting from col. 1, line 46). Aoki also clearly describes the function of each cleaning solution (specifically, col. 2, lines 28-45). Hence, it would have been obvious to one with ordinary skill in the art to apply cleaning solutions (alkaline solutions and acid solutions) in multiple steps **in any combinations** (or repeating the process) as required for a particular product in order to achieve the required cleanness.

Unlike the claimed invention, Aoki does not disclose apply injection of droplets formed by mixing the solution with gas. In a method and system for substrate processing, Okuda teaches that the droplets formed by mixing an alkaline solution (or acid solution) and gas may be injected from a nozzle to a surface of a substrate. The quality of cleaning process is improved. (abstract; [0028], [0295]). Hence, it would have been obvious to one with ordinary skill in the art to apply injection of droplets formed by mixing the solution with gas as disclosed by Okuda in the process of Aoki because Okuda teaches that to do so improves the quality of the cleaning process.

The above-cited claims differ from the prior art by specifying various process parameters (such as ordinary temperature in claim 21; pH value in claim 22) for the alkaline and acid solutions. However, same are known to be result-effective variables and commonly determined by routine experiments. The process of conducting routine experimentations so as to produce an expected result is obvious to one of ordinary skill in the art. In the absence of showing criticality or new, unexpected results, a person

Art Unit: 1765

having ordinary skill in the art would have found it obvious to modify the prior art by performing routine experiments (by using ordinary temperature and adjusting concentration of alkaline solution for desired pH value) to obtain optimal result with a reasonable expectation of success. See the case laws cited below. Also see Verhaverbeke (US 5,972,123; col. 5, lines 25-29; 43-45), Tomita et al. (US 6,431,185; col. 22, lines 40-50) and Skee (US 6,465,403; Table 17A-17E) as evidence. Verhaverbeke discloses that the exposure time, temperature, and concentration may vary in wet etching or cleaning, which clearly shows that temperature is a recognized result-effective variable in the art of wet cleaning. Tomita and Skee show the pH value is a recognized result-effective variable in the art of wet cleaning.

Changes in compositions, temperature, concentrations, or other process conditions of a process do not impart patentability unless the recited ranges are critical (i.e., they produce a new and unexpected result that differs in kind and not merely in degree from the result of the prior art). In re Woodruff, 16USPQ2d 1934,1936 (Fed. Cir.1990); In re Hoeschele, 406 F.2d 1403, 160 USPQ 809; In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). MPEP 2144.05 II.

"Where the principal difference between the claimed process and that taught by the reference is a temperature difference, it is incumbent upon applicant to establish criticality of that difference" Ex parte Khusid, 174 USPQ 59.

4. Claims 11, 12,14, 23, 24,28, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoki et al. (US 5,635,053; hereinafter "Aoki") in view of Hall (US 4,326,553) or Bran (US 6,039,059) as evidenced by Verhaverbeke (US 5,972,123), Tomita et al. (US 6,431,185; hereinafter "Tomita") and Skee (US 6,465,403).

Aoki (col.1 lines 36 to 47) teaches a first step of applying a mixed solution containing an ammonia water and hydrogen peroxide water and a second step of applying a mixed solution containing hydrochloric acid and hydrofluoric acid to efficiently

Art Unit: 1765

clean the surface of a substrate. Aoki teaches using the cleaning solutions (alkaline solutions and acid solutions) in multiple steps **in any combinations** (col. 1, line 42, see also the example starting from col. 1, line 46). Aoki also clearly describes the function of each cleaning solution (specifically, col. 2, lines 28-45). Hence, it would have been obvious to one with ordinary skill in the art to apply cleaning solutions (alkaline solutions and acid solutions) in multiple steps **in any combinations** (or repeating the process) as required for a particular product in order to achieve the required cleanness.

The claimed invention differs from the prior art by specifying conventional method of applying megasonic vibrations to the solution. Hall (abstract; col. 2, lines 12-25) or Bran (US 6,039,059; abstract; col. 1, lines 10-15) is only relied on to show the conventional method of applying megasonic vibrations to the solution. Because it is a convention method and because it is disclosed by Hall or Bran, it would have been obvious to one with ordinary skill in the art to apply megasonic vibrations to the solution in the process of Aoki in order to effectively remove the particles.

Claim 28 differs from the prior art by specifying well-known feature (such as using nozzle to inject droplets of the alkaline solution) to the art of semiconductor device fabrication, the examiner takes official notice. A person having ordinary skill in the art would have found it obvious to modify the prior art by incorporating the nozzle to inject droplets of the alkaline solution to same in order to improve the efficiency of the cleaning process with a reasonable expectation of success.

The above-cited claims differ from the prior art by specifying various process parameters (such as ordinary temperature in claim 23; pH value in claim 24) for the

Art Unit: 1765

alkaline and acid solutions. However, same are known to be result-effective variable and commonly determined by routine experiment. The process of conducting routine experimentations so as to produce an expected result is obvious to one of ordinary skill in the art. In the absence of showing criticality or new, unexpected results, a person having ordinary skill in the art would have found it obvious to modify the prior art by performing routine experiments (by using ordinary temperature and adjusting concentration of alkaline solution for desired pH value) to obtain optimal result with a reasonable expectation of success. See the case laws cited below. Also see Verhaverbeke (US 5,972,123; col. 5, lines 25-29; 43-45) Tomita et al. (US 6,431,185; col. 22, lines 40-50) and Skee (US 6,465,403; Table 17A-17E) as evidence. Verhaverbeke discloses that the exposure time, temperature, and concentration may vary in wet etching or cleaning, which clearly shows that temperature is a recognized result-effective variable in the art of wet cleaning. Tomita and Skee show the pH value is a recognized result-effective variable in the art of wet cleaning.

Changes in compositions, temperature, concentrations, or other process conditions of a process do not impart patentability unless the recited ranges are critical (i.e., they produce a new and unexpected result that differs in kind and not merely in degree from the result of the prior art). *In re Woodruff*, 16USPQ2d 1934,1936 (Fed. Cir.1990); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809; *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). MPEP 2144.05 II.

CRITICALITY OF PROCESSING PARAMETERS

"Where the principal difference between the claimed process and that taught by the reference is a temperature difference, it is incumbent upon applicant to establish criticality of that difference" Ex parte Khusid, 174 USPQ 59.

Response to Arguments

Art Unit: 1765

5. Applicant's arguments filed November 16, 2006 have been fully considered but they are not persuasive.

Applicant has argued that Okuda does not teach supplying an alkaline solution , an acid solution and then an alkaline solution in that order , to the surface of a substrate. It is not persuasive. As has been stated in the office action, Aoki teaches a first step of applying alkaline solution (e.g., a mixed solution containing an ammonia water and hydrogen peroxide water), and a second step of applying an acid solution (e.g., mixed solution containing hydrochloric acid and hydrofluoric acid) to efficiently clean the surface of a substrate. Aoki also teaches using the cleaning solutions (alkaline solutions and acid solutions) in multiple steps **in any combinations** (col.1, line 42, see also the example starting from col. 1, line 46). Aoki also clearly describes the function of each cleaning solution (specifically, col. 2, lines 28-45). Hence, it would have been obvious to one with ordinary skill in the art to apply cleaning solutions (alkaline solutions and acid solutions) in multiple steps **in any combinations** (or repeating the process) as required for a particular product in order to achieve the required cleanness. As such, the combined prior art (Aoki and Okuda) teaches the limitations.

One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. In re Merck & Co., Inc., 800F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant has argued that Aoki does not disclose performing cleaning process steps of three major cleaning steps in order recited. It is not persuasive. As stated in the office action, Aoki teaches using the cleaning solutions (alkaline solutions and acid solutions) in multiple steps **in any combinations** (col.1, line 42, see also the example starting from col. 1, line 46). Aoki also clearly describes the function of each cleaning

Art Unit: 1765

solution (specifically, col. 2, lines 28-45). Hence, it would have been obvious to one with ordinary skill in the art to apply cleaning solutions (alkaline solutions and acid solutions) in multiple steps **in any combinations** (or repeating the process) as required for a particular product in order to achieve the required cleanness, in the absence of showing criticality or new, unexpected results, which is different in kind and not merely in degree from the results of the prior art.

Applicant has argued that Aoki does not teach the alkaline solution is subjected to megasonic vibrations. It is not persuasive. As has been stated in the office action, Hall (abstract; col. 2, lines 12-25) or Bran (abstract; col. 1, lines 10-15) shows the conventional method of applying megasonic vibrations to the solution to effectively remove particles. Therefore, the combined prior art teaches the limitations.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Verhaverbeke (US 5,972,123; col. 5, lines 25-29; 43-45) discloses that the exposure time, temperature, and concentration may vary in wet etching or cleaning. Tomita et al. (US 6,431,185; col. 22, lines 40-50) teaches the theory and principles in pH dependency on the cleaning of the semiconductor substrate. Skee (US 6,465,403; Table 17A-17E) shows the effect of the pH and composition /concentration on the cleaning of the semiconductor substrate.

Art Unit: 1765

7. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (571) 272-1461. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business

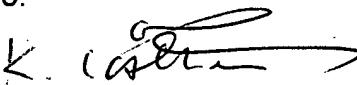
Art Unit: 1765

Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO

Customer Service Representative or access to the automated information system, call

800-786-9199 (IN USA OR CANADA) or 571-272-1000.

December 28, 2006


Kin-Chan Chen
Primary Examiner
Art Unit 1765